IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of **Jonsson et al.**	Patent Pending
Serial No.: 10/799,322	Examiner: Mr. Leon Flores
Filed: March 12, 2004	Group Art Unit: 2611
For: **Method and Apparatus for Received Signal Quality Estimation**	Confirmation No.: 8194
Attorney's Docket No: 4015-5191	

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Dear Sir or Madam:

This appeal brief is timely filed within two months of the Notice of Appeal filed 15 October 2009. Thus, no extension-of-time fees should be required for its entry. Because an appeal brief fee of $540 has been previously paid, no additional fees are believed to be due. However, if any further fees or charges are required, the Commissioner is hereby authorized to charge them to Deposit Account 18-1167.

APPEAL BRIEF

(I.) REAL PARTY IN INTEREST

The real party in interest is Telefonaktiebolaget LM Ericsson (publ).

(II.) RELATED APPEALS AND INTERFERENCES

To the best of Appellant's knowledge, there are no related appeals or interferences.

(III.) STATUS OF CLAIMS

Claims 1-47 are pending. Claims 1-7, 9, 17-22, 24, 28, 31-36, 38 and 42-45 stand rejected by the examiner. Claims 8, 10, 11-16, 21, 23, 25-27, 29-30, 35, 37, 39-41, and 46 are objected to as allowable but for dependency on a rejected base claim. Appellant appeals the rejection of claims 1-7, 9, 17-22, 24, 28, 31-36, 38 and 42-45.

(IV.) STATUS OF AMENDMENTS

No amendments have been submitted subsequent to the Office Action dated 17 July 2009.

(V.) SUMMARY OF CLAIMED SUBJECT MATTER

The pending claims under appeal include claims 1-7, 9, 17-22, 24, 28, 31-36, 38 and 42-45, which include independent claims 1, 17, 31, and 45. No claim under appeal is in means-plus-function or step-plus-function form pursuant to 35 U.S.C. §112, ¶ 6.

Thus, only the independent claims under appeal are summarized below, in accordance with 37 C.F.R. § 41.37(v) and (vii).

A. Independent claim 1

Independent method claim 1 is directed to a method of determining received signal quality for a received signal in an inter-symbol interference canceling receiver. *See* claim 1, preamble. As explained in the Specification, at paragraphs 15 and 16 (p. 7, lines 3-24), it is often necessary for a wireless mobile terminal to determine received signal quality in order to properly generate power control commands for transmission to a serving radio base station (RBS) or to provide channel quality indicators (CQIs) to the radio base station for use in determining appropriate scheduling of radio link resources. However, in complex receivers configured to cancel inter-symbol interference (interference caused by the reception of multiple versions of the transmitted signal arriving via different paths, thus causing "smearing" of the received data symbols), accounting for un-cancelled inter-symbol interference in signal quality calculations can be quite complex. The claimed method is thus directed to a technique that accounts for the inter-symbol interference performance of the receiver by using a simple scalar value that represents the performance of the receiver to scale an estimate of the inter-symbol interference present in the received signal, and estimating the received signal quality based on that scaled estimate. *See* Specification, ¶¶ [0007]-[0008] (p. 3, line 22 – p. 4, line 17).

In particular, the method of claim 1 comprises (1) generating an estimate of inter-symbol interference in the received signal, (2) scaling the estimated inter-symbol

interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver, and (3) estimating the received signal quality based on the scaled estimate of inter-symbol interference.

Figure 2 is a process flow diagram illustrating exemplary processing logic that may be carried out by a receiver processing circuit according to some embodiments; the features of Figure 2 correspond directly to the features of claim 1. As the specification explains, the illustrated processing assumes that samples of the received signal of interest are available for evaluation, and the signal quality estimation processing thus begins with an evaluation of those samples to generate an estimate of inter-symbol interference (ISI) in the received signal, as shown at block 100 of Figure 2. Specification at ¶ [0029] (p. 11, lines 19-23). Particular details of techniques for estimating the ISI are provided in the Specification at paragraphs [0039] to [0042] (p. 14, line 12 – p. 15, line 20).

The claimed method further includes the scaling of the estimated ISI by an appropriately valued cancellation metric that is tied to the ISI cancellation performance of the receiver, as shown at block 102 of Figure 2. *Id.* at ¶ [0030] (p. 11, lines 24-26). In particular, and as claimed in claim 1, this cancellation metric is a simple scalar value that reflects the cancellation performance expected of the interference-cancelling receiver. *Id.* at ¶ [0031] (p. 12, lines 4-5). As the specification explains, this cancellation metric can be a pre-configured value related to pre-characterized cancellation performance of the receiver, or it can be a value that is calculated during

ongoing operations of the receiver, i.e., by measuring the cancellation performance of the receiver during live operation. *Id.* ¶ [0030] (p. 11, line 26 – p. 12, line 3).

Finally, the claimed method includes the estimation of received signal quality for the received signal based on the scaled estimate of inter-symbol interference, as shown at block 104 of Figure 2. This approach allows the receiver to anticipate the cancellation performance from the receiver's combining of the received signal, but without requiring the actual computing of the combining weights that may ultimately be used to effect such combining. *Id.* at ¶ [0031]-[0032] (p. 12, lines 4-22). Details of a particular calculation of the signal quality for the received signal, based on a scalar cancellation metric denoted u, are provided in the Specification at paragraphs [0039] to [0042] (p. 14, line 12 – p. 15, line 20).

B. Independent claim 17

Independent claim 17 is directed to a processing circuit configured for use in an inter-symbol interference canceling receiver. The processing circuit includes an interference estimation circuit, a scaling circuit, and a signal quality estimation circuit that are respectively configured to carry out the generating, scaling, and estimating features of method claim 1. An embodiment of the claimed processing circuit, labeled reference number 36, is illustrated in Figure 4, and is described in the Specification at paragraphs [0034] to [0038] (p. 13, line 4 – p. 14, line 11). In particular, paragraph [0034] notes that the processing circuit 36 may be configured according to the exemplary processing of Figure 2, which is summarized above with respect to claim 1.

C. Independent claim 31

Independent claim 31 is directed to a wireless communication device for use in a wireless communication network. The claimed device includes a receiver configured to receive signals from the network, a transmitter configured to transmit signals to the network, one or more control circuits configured to control operation of the receiver and transmitter, and is described in detail at paragraphs [0033] to [0036] of the Specification (p. 12, line 23 – p. 13, line 24.) Of particular relevance to this appeal, the claimed receiver comprises one or more processing circuits that include an interference estimation circuit, scaling circuit, and signal quality estimation circuit corresponding directly to the circuits of independent claim 17. As with the circuits of claim 17, these circuits are configured to carry out the respective generating, scaling, and estimating features of method claim 1.

D. Independent claim 45

Independent claim 45 is directed to a computer readable medium storing a computer program to determine received signal quality for a received signal in an inter-symbol interference cancelling receiver. In particular, the stored computer program comprises program instructions to carry out each of the generating, scaling, and estimating features of claim 1. Thus, the description summarized above of the processing illustrated in Figure 2 is directly applicable to claim 45.

A detailed description of the processing logic corresponding to claim 45 is found at paragraphs [0029] to [00036] of the Specification (p. 11, line 17 – p. 13, line 24). An

illustration of an exemplary processing flow corresponding to claim 45 is found at Figure 2.

(VI.) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant requests that the Board of Patent Appeals and Interferences review the following grounds of rejection applied in an official action dated 17 July 2009 (hereinafter "the Office Action"):

A. The examiner rejects claims 1-4, 7, 9, 17-20, 22, 24, 28, 31-34, 36, 38, 42-44, and 45 under 35 U.S.C. § 103(a) as allegedly unpatentable over Bottomley *et al.*, "A Generalized RAKE Receiver for Interference Suppression", IEEE Journal on selected areas in communications, vol. 18, no. 8, pp. 1536-45, Aug. 2000 (hereinafter "Bottomley") in view of U.S. Patent Application Pub. No. 2003/0053526 A1, to Reznik (hereinafter "Reznik").

B. The examiner rejects claims 5, 6, 21, and 35 under 35 U.S.C. § 103(a) as allegedly unpatentable over Bottomley in view of Reznik, further in view of US Patent No. 6,985,518 B2 to Nielsen (hereinafter "Nielsen").

C. The examiner rejects claims 1, 17, 31, 45 under 35 U.S.C. § 102(e) as allegedly anticipated by Nielsen.

(VII.) ARGUMENT

A. The Rejections of Claims 1-4, 7, 9, 17-20, 22, 24, 28, 31-34, 36, 38, 42-44, and 45 over Bottomley in view of Reznik.

The examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). If that burden is met, then the burden shifts to the Appellant to overcome the prima facie case with argument and/or evidence. *See id*. The analysis need not seek out precise teachings directed to the specific subject matter of the claim but can take into account the inferences and the creative steps that a person of ordinary skill in the art would employ. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (2007). However, an obviousness rejection cannot be sustained by mere conclusory statements; there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. *Id.*, quoting *In re Kahn*, 441 F. 3d 977, 988 (Fed. Cir. 2006). As shown below in detail, the examiner here fails to meet his burden of presenting a prima facie case of obviousness.

1. The cited combination of references fails to disclose the features of independent claims 1, 17, 31, and 45.

Claim 1 is a method claim directed generally to a method of determining received signal quality in an inter-symbol interference canceling receiver. Independent claims 17 and 31 are closely corresponding apparatus claims directed to a processing circuit and wireless receiver, respectively, each configured to carry out the method of claim 1. Independent claim 45 is directed to a computer-readable medium storing a computer

program comprising program instructions to carry out the method of claim 1. Claim 1 is thus representative of the features of all the pending independent claims, and reads:

1. A method of determining received signal quality for a received signal in an inter-symbol interference canceling receiver comprising:

generating an estimate of inter-symbol interference in the received signal;

scaling the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver; and

estimating the received signal quality based on the scaled estimate of inter-symbol interference.

The examiner's rejections fail to properly establish a prima facie case of obviousness. In particular, the examiner makes specific factual findings including: (1) that Bottomley teaches scaling estimated inter-symbol interference by a cancellation metric, albeit not the cancellation metric of the present claims, Office Action at p. 20; (2) that Reznik teaches, or at least "suggests," scaling estimated inter-symbol interference by a cancellation metric meeting the limitations of the present claims, *id.* at pp. 20-21; and (3) that although estimating received signal quality based on the scaled estimate of inter-symbol interference is taught by neither reference, Bottomley "suggests" such an estimation, *id.* at p. 19. All of these factual findings are incorrect, and unsupported by the cited references.

Indeed, as demonstrated below, the examiner's rejections are based on a finding that a disclosed matrix is somehow equivalent to a scalar value and on a finding that

two references that are utterly silent with respect to either characterizing or measuring cancellation performance of a receiver somehow disclose such a characterization or measurement when combined. These findings of fact are without merit, and all of the pending rejections are thus improper for at least these reasons.

a. Neither reference discloses the claimed "cancellation metric".

Claim 1 recites, in part, "scaling the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver." Claims 17 and 31 include corresponding limitations. In fact, neither reference discloses or suggests such a cancellation metric.

The examiner admits that Bottomley fails to explicitly teach scaling an estimated interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver. Office Action at p. 20. However, the examiner then asserts that "Reznik does," citing Reznik's Equation 10, claim 10, Figures 8 and 9, and paragraphs 40, 50, and 67, and particularly referring to Reznik's "matrix S." *Id.* at pp. 20-21. In fact, Reznik's matrix S is not a scalar value at all. Furthermore, Reznik's matrix S does not represent characterized or measured inter-symbol interference performance of the receiver, and none of the constituent components of Reznik's matrix S represents characterized or measured inter-symbol interference performance of the receiver. The present rejections are all without merit at least for the reason that Reznik does not

disclose or suggest any parameter that represents "characterized or measured inter-symbol interference performance of the receiver," a feature of all of the pending claims.

(1) Reznik's matrix S is not "a scalar value." Reznik's equation (10) does not disclose (or suggest) scaling an estimate of inter-symbol interference by a scalar value at all. Instead, Reznik's Equation 10, which reads " $\vec{d}(m) = \mathbf{S}(\vec{y} - \vec{c}(m))$ ", teaches that a residual interference vector $\vec{c}(m)$, output by a feedback interference processor, is iteratively subtracted from the received signal, with the difference multiplied by a matrix S. Reznik, ¶¶ [0074]-[0075]. None of the components of Reznik's Equation 10 is a scalar value; each of the terms is either a vector or a matrix. *Id.* In particular, Reznik's matrix S, the focus of the examiner's rejections and arguments, is clearly not a scalar value.

The examiner argues that "one skilled in the art would know that Matrix O is composed of scalar values ... [a]nd matrix S is calculated based on matrix O." Final Office Action at p. 3. Appellant does not dispute that Reznik's matrices O and S are formed from scalar values.[1] But it clearly does not follow that matrix S is a scalar value, which term would be understood by a person of ordinary skill in the art to refer to a single real number, rather than a vector or matrix. The examiner's argument on this point is completely spurious.

In remarks accompanying the rejection, the examiner suggests that Appellant is missing the point that the elements in Reznik's equation (10) "are, in fact, being multiplied by a matrix comprised of scalar values." Office Action at p. 3 (emphasis in

original). In fact, the Appellant understands this point very well. However, the real point is that the examiner bears the burden of demonstrating that the prior art discloses or suggests the scaling of an estimated interference with a cancellation metric that comprises a scalar value that represents characterized or measured inter-symbol interference cancellation performance of the receiver. The examiner has not even attempted to identify a scalar value that meets this criterion, notwithstanding repeated hand-waving regarding Reznik's matrices.

<u>(2) Reznik's matrix S does not represent "characterized or measured inter-symbol performance of the receiver."</u> There is no teaching or suggestion in Reznik with regards to a cancellation metric that represents the characterized or measured inter-symbol interference cancellation performance of the receiver. In fact, Reznik is utterly silent with respect to inter-symbol interference cancellation performance of a receiver, and does not provide any hint that the receiver's performance should be measured, characterized, or otherwise quantified. Although the examiner offers Reznik's matrix S for the claimed cancellation metric, Reznik actually teaches that S is calculated directly from estimates of the system channel impulse response, completely without regard to the interference-cancellation performance of a particular receiver. *See* Reznik, ¶¶ [0091]-[0092]. Reznik does not otherwise suggest that either the matrix S or any of its constituent components is somehow representative of the measured or characterized cancellation performance of a receiver.

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[1] In the Office Action at p. 3, the examiner quotes the appellant as stating that "appellant does not dispute that Reznik's matrices O and S are scalar values." This is incorrect. Rather, the Appellant has consistently stated that while Reznik's matrices O and S are <u>formed</u> from scalar values, they are not themselves scalar values.

In the present Office Action, the examiner has elaborated on his contention that Reznik teaches the claimed scalar value representing receiver cancellation performance. The examiner's arguments therein purport to show, inter alia, that: (1) the inter-symbol cancellation performance of Reznik's receiver depends on Matrix A; (2) Matrix A is used to compute Matrix S; and (3) Reznik suggests using "such a scalar value" to scale an estimate of inter-symbol interference in a received signal. *See* Office Action at pp. 5-6, 20-21.

These arguments miss the mark. Whether or not these individual premises are correct (at least the third, in fact, is not), the claims specifically recite a scalar value that "represent[s] characterized or measured inter-symbol interference cancellation performance of the receiver." The examiner's arguments suggest that since ISI cancellation in Reznik's receiver depends on matrix S, then matrix S "represents" the performance of the receiver. This logic utterly fails, given any reasonable understanding of the claimed cancellation metric. The Office Action appears to be simply suggesting that matrix S determines, or has an effect on, the cancellation performance of the receiver. This is true, so far as it goes – as the examiner notes, matrix S is derived from Reznik's matrix A, which includes information about interference present in the received signal. However, a matrix that incorporates information about the *received signal's* instantaneous characteristics is effectively the opposite of what the present claims recite: a value that represents characterized or measured ISI cancellation performance of the *receiver*, i.e., a metric that quantifies how well the cancellation *processing* is expected to perform. Reznik does not in fact disclose or suggest the measuring or characterizing of receiver performance, and does

not in any way disclose or suggest a metric that represents a measured or characterized receiver performance.

b. Neither Reznik nor Bottomley discloses "scaling the estimated inter-symbol interference by a cancellation metric" of any sort.

Claim 1 recites, in part, "scaling the estimated inter-symbol interference by a cancellation metric". Independent claims 17, 31, and 45 include similar limitations. As shown above, neither of the cited references discloses or suggests the particular cancellation metric claimed. Furthermore, neither reference discloses or suggests scaling estimated inter-symbol interference by a cancellation metric of any sort.

<u>(1) Reznik's matrix S is not used to scale an estimate of inter-symbol interference.</u> The examiner clearly cites Reznik's Equation (10) as the basis for concluding that "Reznik suggests scaling the estimated inter-symbol interference by a cancellation metric." *See*, e.g., Office Action at pp. 7, 20. However, Reznik's equation (10) shows only that a residual interference vector $\vec{c}(m)$ is subtracted from a received signal vector $\vec{y}$, and that the resulting difference vector is multiplied by a matrix S. Reznik, ¶ [0075]. Reznik's matrix S is not used to scale an estimate of inter-symbol interference in the received signal. The vector $\vec{y}$ is a filtered version of the received symbol, and the vector $\vec{c}(m)$ corresponds to the residual interference that remains <u>after</u> ISI has been canceled. *Id.* at Figure 9, ¶¶ [0073]-[0076]. Although Reznik refers to the vector $\vec{c}(m)$ in shorthand as "interference estimates", the complete reference is to "us[ing] the direct interference canceller output estimates d to arrive at interference estimates output as a vector c *that were not previously canceled* by the direct

interference canceller." *Id.* at ¶ [0074], emphasis added. Thus, Reznik's brief reference to "interference estimates" is in fact a reference to a residual interference vector, and none of the elements of Equation (10) is the claimed "estimate of inter-symbol interference in the received signal." In any event, Reznik clearly does not teach that its matrix S is used to scale the residual interference vector in any event. Rather, Reznik teaches that the matrix S is multiplied by a difference vector obtained by subtracting a residual interference vector from a received signal vector.

<u>(2) Bottomley does not suggest scaling an estimate of inter-symbol interference.</u>

The examiner asserts that Bottomley teaches scaling estimated inter-symbol interference by a cancellation metric, while admitting that Bottomley fails to disclose the cancellation metric of the claims. Office Action at 20.[2] However, Bottomley does not in fact teach the scaling of estimated inter-symbol interference by any metric at all. Thus, the examiner's proposed incorporation of Reznik's matrix S into "the system of Bottomley" falls apart, and the examiner's rejection fails to establish a *prima facie* case of obviousness.

To support the finding that Bottomley teaches the scaling of estimated inter-symbol interference, the Office Action cites Bottomley's equations (7), (9), and (41), as well as the text introducing equation (42). *Id.* Bottomley's equation (7) illustrates the computation of a decision statistic in a RAKE receiver based on a multiplication of a

[2] In remarks accompanying the present rejections, the examiner argues that "what the reference of Bottomley did fail to teach explicitly was that the scaling was based on <u>scalar values</u>." Office Action at p. 8. Thus, the examiner appears to disagree with the Appellant's characterization of the Office Action as "admitting that Bottomley fails to disclose the cancellation metric of the claims." In any event, the pertinent issue is whether the references disclose or suggest a cancellation metric comprising a scalar value <u>that represents characterized or measured cancellation performance of the receiver</u>, as recited in the claims. Neither reference does, and the Office Action nowhere appears to suggest that Bottomley teaches a non-scalar value that otherwise meets the terms of the claims.

combining weights vector $\mathbf{w}$ by a received signal vector $\mathbf{y}$. Bottomley at p. 1538. Equation (9) illustrates that the combining weights vector $\mathbf{w}$ may be computed through vector multiplication of the inverse of a covariance matrix $\mathbf{R}_u$ (representing a model of total noise and interference) by a vector $\mathbf{h}$ (representing a propagation channel response). *Id.* These first two equations represent operations that might be undertaken in a wireless receiver; however neither operation corresponds to the scaling of an estimate of inter-symbol interference. Equation (41), on the other hand, does not represent actual operations that are performed in a receiver. Rather, Equation (41) represents part of a mathematical explanation as to why a particular interference suppression technique might be effective, given certain circumstances. *Id.* at p. 1539. Thus, Equation (41) illustrates the theoretical application of weights derived for a particular receiver configuration to a particular interference scenario. As Bottomley puts it, "the suppression of interference can be seen by applying the weights (scaling factor omitted) to the interference components of $y(mT_c)$." Bottomley at p. 1541. Nothing in Bottomley suggests that a cancellation metric is being used to scale estimated inter-symbol interference. Rather, Equation (41) illustrates a mathematical model in which receiver combining weights are applied to interference components inherent in a received signal. Read in context, it is clear that these interference components are mathematical models for components of interference to a CDMA signal, not estimates of those components. *See* Bottomley at pp. 1540-41. Bottomley does not teach the estimation of inter-symbol interference, and does not teach that an estimate of inter-symbol interference is scaled with a cancellation metric.

c. *Neither reference discloses or suggests "estimating the received signal quality based on the scaled estimate of inter-symbol interference."*

Claim 1 recites, in part, "estimating the received signal quality based on the scaled estimate of inter-symbol interference." While admitting that this feature of the claims is not "explicitly" taught by Bottomley, the Office Action asserts that Bottomley "suggests" the recited feature.[3] In fact, Bottomley neither discloses nor suggests the claimed feature, and the examiner's rejection is unsupported by the cited references.

Although the examiner admits that Bottomley does not "explicitly" teach the estimation of received signal quality using a scaled estimate of inter-symbol interference, the Office Action asserts that this is "suggested" by Bottomley, citing Bottomley's Equations (41), (42) and (43). Office Action at pp. 19-20. This is simply false, at least because Bottomley simply does not teach the estimation of inter-symbol interference at all, and thus cannot be said to suggest estimating signal quality based on an estimate of inter-symbol interference.

As discussed above, Bottomley's Equation (41) does not represent actual operations that are performed in a receiver. The same applies to Bottomley's Equation (42). Rather, Equations (41) and (42) are part of a mathematical explanation as to why a particular interference suppression technique might be effective, given certain circumstances. Bottomley at p. 1539. Thus, Equations (41) and (42) illustrate the theoretical application of weights derived for a particular receiver configuration to a particular interference scenario. As Bottomley puts it, "the suppression of interference

[3] This assertion represents a significant change in course for the examiner. In a previous office action dated 17 September 2008, the examiner asserted instead that Reznik "suggests" this feature of the claims.

can be seen by applying the weights (scaling factor omitted) to the interference components of $y(mT_c)$." Bottomley at p. 1541. Thus, Equations (41) and (42) illustrate a mathematical model in which receiver combining weights are applied to interference components of a received signal. Read in context, it is clear that these interference components are theoretical models for components of interference to a CDMA signal, not estimates of those components in an actual receiver. *See* Bottomley at pp. 1540-41. Bottomley does not teach the estimation of inter-symbol interference.

Furthermore, Bottomley does not in any event teach the estimation of received signal quality based on an estimate of inter-symbol interference. Once again, the examiner's logic is faulty. At best, the examiner's analysis demonstrates that (actual) inter-symbol interference in a received signal has an effect on the "decision statistic" z output by Bottomley's Figure 2, and that a signal-to-noise ratio for the decision statistic can be computed. *See* Bottomley, Eq. (43). But, nothing in Bottomley even hints at the idea that a received signal quality can or should be estimated based on an estimated inter-symbol interference. Even if inter-symbol interference has an *effect* on the received signal quality (it does), that does not suggest that a particular estimate of the signal quality can or should be based on an *estimate* of the inter-symbol interference. In Bottomley, there is no such estimate.

2. The examiner fails to articulate reasoning with rational underpinning to support the legal conclusion of obviousness of claims 1, 17, and 31.

Even if the numerous deficiencies in the examiner's factual findings are ignored, the rejection still fails to establish a *prima facie* case of obviousness because the

examiner does not show that a person of ordinary skill in the art would find it obvious to combine the alleged teachings of the references to yield the presently claimed invention. Indeed, these alleged teachings cannot in fact be combined to yield the claimed invention.

According to the Office Action, Bottomley teaches scaling estimated inter-symbol interference by a cancellation metric, but does not teach the particular cancellation metric of the present claims. Office Action at p. 20. The Office Action further alleges that Reznik teaches the claimed cancellation metric, proffering Reznik's "matrix S." *Id.* at pp. 20-21. The Office Action then concludes that "it would have been obvious (obvious to try) to one of ordinary skills in the art to have incorporated this feature in the system of Bottomley, in the manner as claimed and as taught by Reznik, for the benefit of suppressing inter-symbol interference at the receiver using a scalar value." *Id.* at p. 21 (emphasis added).

According to the Supreme Court: "When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under §103." *KSR* at 1742. Here, the examiner has not suggested that the teachings of Reznik provide one or more of "a finite number of identified, predictable solutions." Further, the examiner has not provided any indication of precisely how Reznik's matrix S can be incorporated into the system of Bottomley, and has provided only a conclusory allegation that doing

so would have a benefit. Thus, the examiner's rationale that it would have been "obvious to try" to combine Reznik's teachings with those of Bottomley is inadequate on its face.

With respect to the feasibility of the combination, Appellant notes that the examiner appears to allege that Bottomley's $\mathbf{y}_{ISI}(t)$ (as referenced in Bottomley's Equations (16), (18), and (20)) corresponds to the claimed "estimate of inter-symbol interference". *See* Office Action at 19. Accordingly, the examiner's rejection apparently concludes that it "would have been obvious to try" scaling Bottomley's $\mathbf{y}_{ISI}$ with Reznik's matrix S. However, the examiner does not explain what the result of this scaling would be, or why this would be successful. Neither Bottomley nor Reznik provides any hint of what the results of this operation would be, or why it should be attempted. Indeed, as shown above, Reznik teaches that matrix $\mathbf{S}$ may be used in an iterative cancellation loop, and specifically that it should be multiplied by a difference vector formed from subtracting a residual interference vector $\vec{c}(m)$ from a received signal vector $\vec{y}$. *See* Reznik ¶ [0075]. The examiner's rejection, however, appears to propose that Reznik's matrix S should be multiplied by Bottomley's $\mathbf{y}_{ISI}(t)$, which comprises one of several theoretical components of the sampled output of a matched filter. *See* Bottomley at p. 1539 (particularly Eq. (20)). Appellant is at a loss to know what the result of applying Reznik's matrix S to a completely different quantity would represent, and neither reference provides any suggestion of how this result might subsequently be used to determine a received signal quality for a received signal in Bottomley's system. The Office Action provides no details of how this should be done, either. The examiner's

supposed rationale for combining the references is thus nothing more than an unsupported allegation that two distinct and incompatible processes can somehow be combined to yield the claimed invention.

Similarly, after acknowledging that neither reference teaches estimating received signal quality based on a scaled estimate of inter-symbol interference, the Office alleges that Bottomley "suggests" doing so, and asserts that "it would have been obvious to one of ordinary skills in the art to incorporate this feature into the system of Bottomley, in the manner as claimed..." Office Action at p. 20. Again, the examiner supports the legal conclusion of obviousness with a mere conclusory statement . Again, the examiner is merely splicing together unconnected snippets of the cited references and simply asserting that it would be obvious to combine them, without any explanation of how the teachings should be combined. Again, the Appellant is at a loss to understand precisely how Bottomley should be modified, using the "suggestion" found by the examiner, to yield the claimed invention. Again, the cited references (and the Office Action) are utterly devoid of any suggestion that such a modification would be successful, or even that such a modification is possible. And again, the examiner's conclusion of obviousness is utterly unsupported by any articulated reasoning with a rational underpinning.

3. The rejections of at least dependent claims 3, 4, 19, 20, 33, 34, and 43 are unsupported by the references and legally improper.

The rejections of at least dependent claims 3-6, 19-21, 33-35, and 43 are each based on either vague and unsupported citations to the references, unsupported

allegations that "one skilled in the art would know" of the claimed feature, or both. These rejections fail utterly to establish a prima facie case of obviousness for the corresponding dependent claims, and these rejections are thus improper for at least these additional reasons.

a. Claims 3, 19, 33, and 43 are not rendered obvious by the cited references.

Claim 3 recites, in part, "transmitting corresponding channel quality information to a supporting wireless communication network." Claims 19, 33, and 43 have corresponding limitations. The examiner first alleges that the combination of Bottomley and Reznik discloses the claimed feature, but then asserts: "Furthermore, one skilled in the art would know that WCDMA require mobile terminals to compute received signal quality and transmit TCP commands back to the Base station." Office Action at p. 21. In fact, neither Bottomley nor Reznik make any mention of transmitting channel quality information (or any other information) to a supporting wireless communication network, and the examiner's further allegations are without support in the record.

b. Claims 4, 20, and 34 are not rendered obvious by the cited references.

Claim 4 recites, in part, "generating corresponding link power control commands, and transmitting the link power control commands to a supporting wireless communication network." Claims 20 and 34 have corresponding limitations. The examiner's rejections of these claims are identical to those of claims 3, 19, and 33, and are similarly unsupported by the cited references.

B. The Rejections of Claims 5, 6, 21, and 35 over Bottomley in view of Reznik and Nielsen.

Claims 5, 6, 21, and 35 are rejected as allegedly obvious over Bottomley in view of Reznik and further in view of Nielsen. Claims 5 and 6 depend from claim 1, claim 21 depends from independent claim 17, and claim 35 depends from independent claim 31. Because the rejections of these dependent claims are based in part on the same erroneous findings and legal conclusions discussed above for the independent claims, these rejections are necessarily improper for the same reasons and should be reversed. However, these rejections are improper for additional reasons given below.

1. Claims 5, 21, and 35 are not rendered obvious by the cited references.

Claim 5 recites, in part, "storing the cancellation metric in a memory of the receiver as a pre-configured value." Claims 21 and 35 have corresponding limitations. The examiner acknowledges that the claimed feature is not disclosed by the cited references, but then asserts that Nielsen discloses the claimed feature, citing Nielsen's Fig. 4 & col. 6, lines 24-50. Office Action at p. 27. Appellant can discern no basis whatsoever for this allegation, in the cited portions or elsewhere in Nielsen. Indeed, the cited portion of Nielsen appears to describe a dynamic optimization of a scalar value r_0; if anything, the described process appears to suggest precisely the opposite approach to using a pre-configured value stored in memory, as recited in claims 5, 21, and 35.

2. Claim 6 is not rendered obvious by the cited references.

Claim 6 depends on claim 5 and recites, in part, "determining the pre-configured value of the cancellation metric by characterizing inter-symbol interference cancellation performance of the receiver, or of a same type of receiver." The examiner alleges that the claimed feature is disclosed by Nielsen, again citing Nielsen's Fig. 4 & col. 6, lines 24-50. Office Action at p. 27. In fact, none of the references, including Nielsen makes any mention of characterizing the inter-symbol interference cancellation performance of a receiver. The Apellant can discern no basis in the cited portion of Nielsen for the examiner's assertions.

C. The Rejections of Claims 1, 17, 31, 45 over Nielsen.

As noted in the Manual for Patent Examining Procedure (MPEP), "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP § 2131, quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Furthermore: "The identical invention must be shown in as complete detail as is contained in the ... claim," *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989); and: "The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required, *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990).

The examiner has not and cannot demonstrate that each and every element of independent claims 1, 17, 31, and 45 is found, either expressly or inherently described, in Nielsen. Indeed, the skimpy analysis accompanying the rejections under Nielsen consists of an unsupported finding of "inherency" coupled with a few sketchy citations to Nielsen that stand up to no scrutiny. The rejections over Nielsen should be reversed.

The Office Action begins its rejection of claim 1 by asserting that Nielsen discloses the claimed "generating an estimate of inter-symbol interference in the received signal," arguing that "since [Nielsen's] system is capable of cancelling interference, it is inherent that it is also capable of estimating the interference." Office Action at p. 28. The Office Action provides no basis for this finding of inherency. This is improper, as the law is clear that an examiner must provide a rationale or evidence tending to show inherency to support a rejection depending on such a finding. *See* MPEP § 2112 (III). As the MPEP explains: "The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic," *id.*, citing *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). Further: "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient'," *id.*, citing *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). Thus: "In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to

reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art," *id.*, citing *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

Here, the examiner provides no evidence to support the finding of inherency. Furthermore, the "rationale" provided by the examiner, that "since this system is capable of cancelling interference, it is inherent that it is also capable of estimating the interference," is a conclusory allegation that defies logic.

Next, the Office Action asserts that Nielsen discloses "scaling the estimated inter-symbol interference by a cancellation metric comprising a scalar value corresponding to inter-symbol interference cancellation performance of the receiver," citing Nielsen's Figs. 1-2 & 4, col. 5, line 30 – col. 6, line 50. Office Action at p. 28. As an initial matter, Appellant notes that in the claims, the scalar value "represents" characterized or measured inter-symbol interference cancellation performance of the receiver, and does not merely "correspond" to it. Nielsen's scalar value r_0 in no way represents cancellation performance of a receiver. Rather, r_0 is simply a scaling parameter that represents the proportion of Nielsen's "independent noise" to "dependent noise." Nielsen at col. 5, lines 59-65. Thus, r_0 provides some information about the characteristics of a received signal, and provides no information about the measured or characterized interference cancellation performance of the receiver.

Finally, the Office Action states that Nielsen discloses "estimating the received signal quality based on the scaled estimate of inter-symbol interference," citing Nielsen's Fig. 4:46. Office Action at p. 28. This finding turns the actual teachings of

Nielsen completely upside down. In fact, Nielsen clearly shows that a signal quality (SNRz) is based on the decision statistic z, and that the SNRz is used in turn to determine the value of r_0, Nielsen's feed-back loop scaling parameter. *See* Nielsen Fig. 4, boxes 48, 46, and 40. Nielsen does not show that a received signal quality is estimated based on a scaled estimate of inter-symbol interference.

The rejections of claims 17, 31, and 45 over Nielsen are based directly on the rejection of claim 1. Because the Office Action fails to establish that the features of claims 1, 17, 31, and 45 are disclosed in Nielsen, either expressly or inherently, these rejections should be reversed.

Respectfully submitted,

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CLAIMS APPENDIX

The following claims are on appeal:

1. A method of determining received signal quality for a received signal in an inter-symbol interference canceling receiver comprising:

generating an estimate of inter-symbol interference in the received signal;

scaling the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver; and

estimating the received signal quality based on the scaled estimate of inter-symbol interference.

2. The method of claim 1, wherein estimating the received signal quality based on the scaled estimate of inter-symbol interference comprises estimating a signal-to-interference ratio of the received signal.

3. The method of claim 2, further comprising periodically estimating the signal-to-interference ratio of the received signal and periodically transmitting corresponding channel quality information to a supporting wireless communication network.

4. The method of claim 2, further comprising periodically estimating the signal-to-interference ratio of the received signal, generating corresponding link power control commands, and transmitting the link power control commands to a supporting wireless communication network.

5. The method of claim 1, further comprising storing the cancellation metric in a memory of the receiver as a pre-configured value.

6. The method of claim 5, further comprising determining the pre-configured value of the cancellation metric by characterizing inter-symbol interference cancellation performance of the receiver, or of a same type of receiver.

7. The method of claim 1, further comprising maintaining the cancellation metric as a dynamically updated value based on inter-symbol interference cancellation performance of the receiver as measured during operation.

9. The method of claim 1, wherein generating an estimate of inter-symbol interference in the received signal comprises generating an expected value of the inter-symbol interference in the received signal.

17. A processing circuit configured for use in an inter-symbol interference canceling receiver, the processing circuit comprising:

an interference estimation circuit configured to generate an estimate of inter-symbol interference in the received signal;

a scaling circuit included in, or associated with, the interference estimation circuit and configured to scale the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver; and

a signal quality estimation circuit configured to estimate the received signal quality based on the scaled estimate of inter-symbol interference.

18. The processing circuit of claim 17, wherein the processing circuit is configured to estimate the received signal quality based on the scaled estimate of inter-symbol interference by estimating a signal-to-interference ratio of the received signal.

19. The processing circuit of claim 18, wherein the processing circuit is configured to periodically estimate the signal-to-interference ratio of the received signal for periodic transmission of corresponding channel quality information to a supporting wireless communication network.

20. The processing circuit of claim 18, wherein the processing circuit is configured to periodically estimate the signal-to-interference ratio of the received signal and generate corresponding link power control commands for transmission to a supporting wireless communication network.

21. The processing circuit of claim 17, wherein the processing circuit is configured to receive a pre-configured value from a memory in the receiver as the cancellation metric.

22. The processing circuit of claim 17, wherein the processing circuit is configured to maintain the cancellation metric as a dynamically updated value based on inter-symbol interference cancellation performance of the receiver as measured during operation.

24. The processing circuit of claim 17, wherein the processing circuit is configured to generate an estimate of inter-symbol interference in the received signal by generating an expected value of the inter-symbol interference in the received signal.

28. The processing circuit of claim 17, wherein the processing circuit comprises at least a portion of an integrated circuit device that is arranged and configured for baseband signal processing in a wireless communication receiver.

31. A wireless communication device for use in a wireless communication network comprising:

a receiver configured to receive signals from the network;

a transmitter configured to transmit signals to the network;

one or more control circuits configured to control operation of the receiver and transmitter; and

said receiver comprising one or processing circuits comprising:

an interference estimation circuit configured to generate an estimate of inter-symbol interference in the received signal;

a scaling circuit included in, or associated with, the interference estimation circuit and configured to scale the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver; and

a signal quality estimation circuit configured to estimate the received signal quality based on the scaled estimate of inter-symbol interference.

32. The device of claim 31, wherein the processing circuit is configured to estimate the received signal quality based on the scaled estimate of inter-symbol interference by estimating a signal-to-interference ratio of the received signal.

33. The device of claim 32, wherein the processing circuit is configured to periodically estimate the signal-to-interference ratio of the received signal and wherein the device is configured to periodically transmit corresponding channel quality information to a supporting wireless communication network.

34. The device of claim 32, wherein the processing circuit is configured to periodically estimate the signal-to-interference ratio of the received signal and generate corresponding link power control commands, and wherein the device is configured to transmit the link power control commands to a supporting wireless communication network.

35. The device of claim 31, wherein the processing circuit is configured to receive a pre-configured value from a memory in the device as the cancellation metric.

36. The device of claim 31, wherein the processing circuit is configured to maintain the cancellation metric as a dynamically updated value based on inter-symbol interference cancellation performance of the receiver as measured during operation.

38. The device of claim 31, wherein the processing circuit is configured to generate an estimate of inter-symbol interference in the received signal by generating an expected value of the inter-symbol interference in the received signal.

42. The device of claim 31, wherein the device comprises a mobile terminal configured for operation in a WCDMA wireless communication network, and wherein the device is configured to determine the received signal quality via use of the processing circuit for one or more received WCDMA signal transmitted by the network.

43. The device of claim 42, wherein the mobile terminal is configured periodically to report Channel Quality Information for a High Speed Packet Data Service signal transmitted by the network based on determining received signal quality for the signal via the processing circuit.

44. The device of claim 42, wherein the mobile terminal is configured periodically to transmit forward link power control commands to the network based on determining received signal quality via the processing circuit for one or more WCDMA signals transmitted by the network.

45. A computer readable medium storing a computer program to determine received signal quality for a received signal in an inter-symbol interference canceling receiver, the computer program comprising:

program instructions to generate an estimate of inter-symbol interference in the received signal;

program instructions to scale the estimated inter-symbol interference by a cancellation metric comprising a scalar value representing characterized or measured inter-symbol interference cancellation performance of the receiver; and

program instructions to estimate the received signal quality based on the scaled estimate of inter-symbol interference.

EVIDENCE APPENDIX

No evidence was submitted by Appellant pursuant to 37 CFR §§ 1.130, 1.131, or 1.132, and no other evidence was entered by the examiner and relied upon by appellant in this appeal.

(X.) RELATED PROCEEDINGS APPENDIX

No related proceedings have been identified.